

VOLUME 61, 1983

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<sup>1</sup>The permission of the ICSU AB, Paris, for the Canadian Journal of Physics to use this subject classification is gratefully acknowledged.

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07.25	<i>Hygrometry</i>	12.40Q	<i>Potential models</i>
07.30	<i>Vacuum production and techniques</i>	12.40R	<i>Peripheral models (one or more particle exchange)</i>
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07.30D	<i>Vacuum meters</i>	12.40V	<i>Vector-meson dominance</i>
07.35	<i>High pressure production and techniques</i>	12.70	<i>Hadron mass formulas</i>
07.50	<i>Electrical instruments and techniques</i>	12.90	<i>Miscellaneous theoretical ideas and models</i>
07.55	<i>Magnetic instruments and techniques</i>		
07.58	<i>Magnetic resonance spectrometers, auxiliary instruments and techniques</i>	13.00	<b>SPECIFIC REACTIONS AND PHENOMENOLOGY</b>
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07.60D	<i>Photometry and radiometry</i>	13.15	<i>Neutrino interactions</i>
07.60F	<i>Polarimetry and ellipsometry</i>	13.20	<i>Leptonic and semileptonic decays of mesons</i>
07.60H	<i>Refractometry and reflectometry</i>	13.25	<i>Hadronic decays of mesons</i>
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07.60P	<i>Optical microscopy</i>	13.35	<i>Decays of leptons</i>
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07.65G	<i>IR spectroscopy and spectrometers</i>	13.40H	<i>Electromagnetic decays</i>
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07.80	<i>Electron and ion microscopes and techniques</i>	13.60H	<i>Total and inclusive cross sections</i>
07.85	<i>X-ray, gamma-ray instruments and techniques</i>	13.60K	<i>Meson production</i>
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		13.60P	<i>Baryon and baryon resonance production</i>
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11.00	<b>GENERAL THEORY OF FIELDS AND PARTICLES</b>	13.75C	<i>Nucleon-nucleon interactions, including antinucleon, deuteron etc. (energy <math>\leq 10</math> GeV)</i>
11.10	<i>Field theory</i>	13.75E	<i>Hyperon-nucleon interactions (energy <math>\leq 10</math> GeV)</i>
11.20	<i>S-matrix theory</i>	13.75G	<i>Pion-baryon interactions (energy <math>\leq 10</math> GeV)</i>
11.30	<i>Symmetry and conservation laws</i>	13.75J	<i>Kaon-baryon interactions (energy <math>\leq 10</math> GeV)</i>
11.40	<i>Currents and their properties</i>	13.75L	<i>Meson-meson interactions (energy <math>\leq 10</math> GeV)</i>
11.50	<i>Dispersion relations and sum rules</i>	13.85	<i>Hadron-induced high- and super-high-energy interactions, energy <math>&gt; 10</math> GeV</i>
11.60	<i>Complex angular momentum; Regge formalism</i>	13.85D	<i>Elastic scattering (energy <math>&gt; 10</math> GeV)</i>
11.80	<i>Relativistic scattering theory</i>	13.85F	<i>Inelastic scattering, two-particle final states (energy <math>&gt; 10</math> GeV)</i>
11.90	<i>Other topics in general field and particle theory</i>	13.85H	<i>Inelastic scattering, many-particle final states (energy <math>&gt; 10</math> GeV)</i>
12.00	<b>SPECIFIC THEORIES AND INTERACTION MODELS: PARTICLE SYSTEMATICS</b>	13.85K	<i>Inclusive reactions, including total cross sections (energy <math>&gt; 10</math> GeV)</i>
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12.20	<i>Models of electromagnetic interactions</i>	13.88	<i>Polarization in interactions and scattering</i>
12.20D	<i>Specific calculations and limits of quantum electrodynamics</i>	13.90	<i>Other topics in specific reactions and phenomenology of elementary particles</i>
12.20F	<i>Experimental tests of quantum electrodynamics</i>	14.00	<b>PROPERTIES OF SPECIFIC PARTICLES AND RESONANCES</b>
12.25	<i>Models for gravitational interactions</i>	14.20	<i>Baryons and baryon resonances</i>
12.30	<i>Models of weak interactions</i>	14.40	<i>Mesons and meson resonances</i>
12.35	<i>Composite models of particles</i>	14.60	<i>Leptons</i>
12.35C	<i>General properties of quantum chromodynamics (dynamics, confinement, etc.)</i>	14.80	<i>Other and hypothetical particles</i>
12.35E	<i>Applications of quantum chromodynamics to particle properties and reactions</i>	20.00	<b>NUCLEAR PHYSICS</b>
12.35H	<i>Phenomenological composite models of particle structure and reactions (partons, bags, etc.)</i>	21.00	<b>NUCLEAR STRUCTURE</b>
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- 21.10F *Shape, charge, radius and form factors*  
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 25.40 Nucleon-induced reactions and scattering  
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 27.20  $6 \leq A \leq 19$   
 27.30  $20 \leq A \leq 38$   
 27.40  $39 \leq A \leq 58$   
 27.50  $59 \leq A \leq 89$   
 27.60  $90 \leq A \leq 149$   
 27.70  $150 \leq A \leq 189$   
 27.80  $190 \leq A \leq 219$   
 27.90  $220 \leq A$
- 28.00 NUCLEAR ENGINEERING AND NUCLEAR POWER STUDIES  
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 28.43 Fission reactor operation  
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 28.50 Fission reactor types and applications  
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 47.55 Nonhomogeneous flows  
 47.55B Cavitation  
 47.55C Jets  
 47.55E Nozzles  
 47.55H Stratified flows  
 47.55K Multiphase flows  
 47.55M Flow through porous media  
 47.60 Flows in ducts, channels, and conduits  
 47.65 Magnetohydrodynamics and electrohydrodynamics  
 47.70 Reactive, radiative, or nonequilibrium flows  
 47.75 Relativistic fluid dynamics  
 47.80 Instrumentation for fluid dynamics  
 47.90 Other topics in fluid dynamics
- 50.00 **FLUIDS, PLASMAS, AND ELECTRIC DISCHARGES**
- 51.00 **KINETIC AND TRANSPORT THEORY OF FLUIDS; PHYSICAL PROPERTIES OF GASES**  
 51.10 Kinetic and transport theory  
 51.20 Viscosity and diffusion, experimental  
 51.30 Thermal properties of gases  
 51.40 Acoustical properties of gases; ultrasonic relaxation  
 51.50 Electrical phenomena in gases  
 51.60 Magnetic phenomena in gases  
 51.70 Optical phenomena in gases  
 51.90 Other topics in the physics of fluids
- 52.00 **THE PHYSICS OF PLASMAS AND ELECTRIC DISCHARGES**  
 52.20 Elementary processes in plasma  
 52.20F Electron collisions  
 52.20H Atomic, molecular, heavy-particle collisions  
 52.25 Plasma basic properties  
 52.25F Transport properties  
 52.25P Emission, absorption, and scattering of radiation  
 52.30 Plasma flow; magnetohydrodynamics  
 52.35 Waves, oscillations, and instabilities in plasma  
 52.35R Plasma turbulence  
 52.35T Shock waves  
 52.40 Plasma interactions  
 52.40D Electromagnetic wave propagation in plasma  
 52.40F Antennas in plasma; plasma-filled wave guides  
 52.40H Solid-plasma interactions  
 52.40K Sheaths  
 52.40M Beam interactions in plasma  
 52.50 Plasma production and heating  
 52.50J Plasma production and heating by laser beams  
 52.50L Plasma production and heating by shock wave and wire explosion  
 52.55 Plasma equilibrium and confinement  
 52.60 Relativistic plasma  
 52.65 Plasma simulation  
 52.70 Plasma diagnostic techniques and instrumentation  
 52.75 Plasma devices and applications  
 52.80 Electric discharges  
 52.90 Other topics in plasma physics and electric discharges
- 60.00 **CONDENSED MATTER: STRUCTURE, THERMAL AND MECHANICAL PROPERTIES**
- 61.00 **STRUCTURE OF LIQUIDS AND SOLIDS; CRYSTALLOGRAPHY**  
 61.10 X-ray determination of structures  
 61.10D Theories of diffraction and scattering  
 61.10F Experimental techniques  
 61.12 Neutron determination of structures  
 61.14 Electron determination of structures  
 61.14D Theories of diffraction and scattering  
 61.14F Experimental diffraction and scattering  
 61.14H Low-energy electron diffraction (LEED) and reflection high-energy electron diffraction (RHEED)  
 61.16 Other determination of structures  
 61.16D Electron microscopy determinations  
 61.16F Field-ion microscopy determinations  
 61.16N EPR and NMR determinations  
 61.20 Classical, semiclassical, and quantum theories of liquid structure  
 61.25 Studies of specific liquid structures  
 61.25M Liquid metals  
 61.30 Liquid crystals  
 61.40 Amorphous and polymeric materials  
 61.40D Glasses  
 61.40K Polymers, elastomers, and plastics  
 61.50 Crystalline state  
 61.50C Physics of crystal growth  
 61.50E Crystal symmetry; models and space groups, and crystalline systems and classes  
 61.50J Crystal morphology and orientation  
 61.50K Crystallographic aspects of polymorphic and order-disorder transformations  
 61.50L Crystal binding  
 61.55 Specific structure of elements and alloys  
 61.55D Nonmetallic elements  
 61.55F Metallic elements  
 61.55H Alloys  
 61.60 Specific structure of inorganic compounds  
 61.65 Specific structure of organic compounds  
 61.70 Defects in crystals  
 61.70B Interstitials and vacancies  
 61.70D Colour centres  
 61.70E Other point defects  
 61.70G Dislocations: theory  
 61.70J Etch pits, decoration, transmission electron-microscopy and other direct observations of dislocations  
 61.70L Slip, creep, internal friction and other indirect evidence of dislocations  
 61.70N Grain and twin boundaries  
 61.70P Stacking faults, stacking fault tetrahedra, and other planar or extended defects  
 61.70R Crystal impurities: general  
 61.70T Doping and implantation of impurities  
 61.70W Impurity concentration, distribution, and gradients  
 61.70Y Interaction between different crystal structure defects  
 61.80 Radiation damage and other irradiation effects  
 61.80B Laser beams  
 61.80C X-rays  
 61.80E Gamma rays  
 61.80F Electrons and positrons  
 61.80H Neutrons  
 61.80J Ions  
 61.80L Atoms and molecules  
 61.80M Channelling, blocking and energy loss of particles  
 61.90 Other topics in structure of liquids and solids
- 62.00 **MECHANICAL AND ACOUSTIC PROPERTIES OF CONDENSED MATTER**  
 62.10 Mechanical properties of liquids



- 62.20 Mechanical properties of solids (related to microscopic structure)  
 62.20D Elastic constants  
 62.20F Deformation and plasticity  
 62.20H Creep  
 62.20M Fatigue, brittleness, fracture, and cracks  
 62.20P Tribology  
 62.30 Mechanical and elastic waves  
 62.40 Anelasticity, internal friction, and damping  
 62.50 High-pressure and shock-wave effects in solids  
 62.60 Acoustic properties of liquids  
 62.65 Acoustic properties of solids  
 62.80 Ultrasonic relaxation  
 62.90 Other topics in mechanical and acoustical properties of condensed matter
- 63.00 LATTICE DYNAMICS AND CRYSTAL STATISTICS  
 63.10 General theory  
 63.20 Phonons and vibrations in crystal lattices  
 63.20D Phonon states and bands, normal modes, and phonon dispersion  
 63.20H Phonon-phonon interactions  
 63.20K Phonon-electron interactions  
 63.20M Phonon-defect interactions  
 63.20P Localized modes  
 63.50 Vibrational states in disordered systems  
 63.70 Statistical mechanics of lattice vibrations  
 63.75 Statistical mechanics of displacive phase-transitions  
 63.90 Other topics in lattice dynamics and crystal statistics
- 64.00 EQUATIONS OF STATE, PHASE EQUILIBRIA, AND PHASE TRANSITIONS  
 64.10 General theory of equations of state and phase equilibria  
 64.30 Equations of state of specific substances  
 64.60 General studies of phase transitions  
 64.70 Phase equilibria, phase transitions, and critical points  
 64.70D Solid-liquid transitions  
 64.70F Liquid-vapour transitions  
 64.70H Solid-vapour transitions  
 64.70J Liquid-liquid transitions  
 64.70K Solid-solid transitions  
 64.70M Transitions in liquid crystals  
 64.70P Glass transitions  
 64.75 Solubility, segregation, and mixing  
 64.80 Other phase properties of systems  
 64.90 Other topics in equations of state, phase equilibria, and phase transitions
- 65.00 THERMAL PROPERTIES OF CONDENSED MATTER  
 65.20 Heat capacities of liquids  
 65.40 Heat capacities of solids  
 65.50 Thermodynamic properties and entropy  
 65.70 Thermal expansion and thermomechanical effects  
 65.90 Other topics in thermal properties of condensed matter
- 66.00 TRANSPORT PROPERTIES OF CONDENSED MATTER (NONELECTRONIC)  
 66.10 Diffusion and ionic conduction in liquids  
 66.20 Diffusive momentum transport  
 66.30 Diffusion in solids  
 66.30D Theory of diffusion and ionic conduction in solids  
 66.30F Self-diffusion in metals, semimetals, and alloys  
 66.30H Self-diffusion and ionic conduction in nonmetals  
 66.30J Diffusion, migration, and displacement of impurities  
 66.30L Diffusion, migration, and displacement of other defects  
 66.30N Chemical interdiffusion  
 66.30Q Electromigration  
 66.60 Thermal conduction in nonmetallic liquids  
 66.70 Nonelectronic thermal conduction and heat-pulse propagation in nonmetallic solids  
 66.90 Other topics in nonelectronic transport properties
- 67.00 QUANTUM FLUIDS AND SOLIDS: LIQUID AND SOLID HELIUM  
 67.20 Quantum effects on the structure and dynamics of nondegenerate fluids  
 67.40 Boson degeneracy and superfluidity of helium-4  
 67.50 Fermi fluids; liquid helium-3  
 67.60 Mixed systems; liquid helium 3-4 mixtures  
 67.70 Films  
 67.80 Solid helium and related quantum crystals  
 67.90 Other topics in quantum fluids and solids (e.g. neutron-star matter)
- 68.00 SURFACES AND INTERFACES: THIN FILMS AND WHISKERS  
 68.10 Fluid surfaces and interfaces with fluids  
 68.15 Liquid thin films  
 68.20 Solid surface structure  
 68.25 Mechanical and acoustical properties of solid surfaces and interfaces  
 68.30 Dynamics of solid surfaces and interface vibrations  
 68.40 Surface energy of solid; thermodynamic properties  
 68.45 Solid-fluid interface processes  
 68.48 Solid-solid interfaces  
 68.55 Thin film growth, structure, and epitaxy  
 68.60 Physical properties of thin films, nonelectronic  
 68.70 Whiskers and dendrites: growth, structure, and nonelectronic properties  
 68.90 Other topics in the structure and nonelectronic properties of surfaces and thin films
- 70.00 CONDENSED MATTER: ELECTRONIC STRUCTURE, ELECTRICAL, MAGNETIC, AND OPTICAL PROPERTIES  
 71.00 ELECTRON STATES  
 71.10 General theories and computational techniques  
 71.20 Electronic density of states determinations  
 71.25 Nonlocalized single-particle electronic states  
 71.25C Techniques of band-structure calculation (general theory, applications of group theory, analytic continuation, etc.)  
 71.25H Measurement of Fermi surface parameters  
 71.25J Effective mass and g-factors  
 71.25L Electron energy states in liquid metals  
 71.25M Electron energy states in amorphous and glassy solids  
 71.25P Band structure of crystalline metals  
 71.25R Band structure of crystalline elemental semiconductors  
 71.25T Band structure of crystalline semiconductor compounds and insulators  
 71.30 Metal-insulator transitions  
 71.35 Excitons and related phenomena  
 71.36 Polaritons  
 71.38 Polarons and electron-phonon interactions

- 71.45 Collective effects  
 71.45G *Exchange, correlation, dielectric and magnetic functions, plasmons*  
 71.45J *Fermi-Thomas model*  
 71.45N *Calculations of total electronic binding energy*  
 71.50 Localized single-particle electronic states  
 71.55 Impurity and defect levels  
 71.55J *Localization in disordered structures*  
 71.65 Positron states  
 71.70 Level splitting and interactions  
 71.70C *Crystal and ligand fields*  
 71.70E *Spin-orbit coupling, Zeeman, Stark, and strain splitting*  
 71.70G *Exchange interactions*  
 71.70J *Nuclear states and interactions*  
 71.90 Other topics in electron states
- 72.00 ELECTRONIC TRANSPORT IN CONDENSED MATTER  
 72.10 Theory of electronic transport; scattering mechanisms  
 72.15 Electronic conduction in metals and alloys  
 72.15C *Electrical and thermal conduction in amorphous and liquid metals and alloys*  
 72.15E *Electrical and thermal conduction in crystalline metals and alloys*  
 72.15G *Galvanomagnetic and other magnetotransport effects*  
 72.15H *Thermomagnetic effects*  
 72.15J *Thermoelectric effects*  
 72.15L *Relaxation times and mean free paths*  
 72.15N *Collective modes; e.g. in one-dimensional conductors*  
 72.15Q *Scattering mechanisms and Kondo effect*  
 72.20 Conductivity phenomena in semiconductors and insulators  
 72.20D *General theory, scattering mechanisms*  
 72.20F *Low-field transport and mobility; piezoresistance*  
 72.20H *High-field and nonlinear effects*  
 72.20J *Charge carriers: generation, recombination, lifetime, and trapping*  
 72.20M *Galvanomagnetic and other magnetotransport effects*  
 72.20N *Thermomagnetic effects*  
 72.20P *Thermoelectric effects*  
 72.30 High-frequency effects; plasma effects  
 72.40 Photoconduction and photovoltaic effects; photodielectric effects  
 72.50 Acoustoelectric effects  
 72.55 Magnetoacoustic effects  
 72.60 Mixed conductivity and conductivity transitions  
 72.70 Noise processes and phenomena  
 72.80 Conductivity of specific semiconductors and insulators  
 72.80C *Elemental semiconductors*  
 72.80E *III-V and II-VI semiconductors*  
 72.80G *Transition-metal compounds*  
 72.80J *Other crystalline inorganic semiconductors*  
 72.80L *Organic semiconductors*  
 72.80N *Amorphous and glassy semiconductors*  
 72.80P *Liquid semiconductors*  
 72.90 Other topics in electronic transport in condensed matter
- 73.00 ELECTRONIC STRUCTURE AND ELECTRICAL PROPERTIES OF SURFACES, INTERFACES, AND THIN FILMS  
 73.20 Electronic surface states  
 73.25 Surface conductivity  
 73.30 Surface double layers, Schottky barriers, and work functions  
 73.40 Interfaces  
 73.40B *Static electrification*  
 73.40G *Tunnelling, general*  
 73.40J *Metal-to-metal contacts*  
 73.40L *Semiconductor-to-semiconductor contacts, p-n junctions, and heterojunctions*  
 73.40M *Semiconductor-electrolyte contacts*  
 73.40N *Metal-nonmetal contacts*  
 73.40Q *Metal-insulator-semiconductor structures*  
 73.40R *Metal-insulator-metal structures*  
 73.40S *Metal-semiconductor-metal structures*  
 73.60 Electronic properties of thin films  
 73.60D *Metallic thin films*  
 73.60F *Semiconductor films*  
 73.60H *Insulating thin films*  
 73.60K *Superconducting films*  
 73.90 Other topics in electrical properties of surfaces, interfaces, and thin films
- 74.00 SUPERCONDUCTIVITY  
 74.10 Occurrence, critical temperature  
 74.20 Theory  
 74.20F *BCS theory and its applications*  
 74.30 General properties  
 74.30C *Magnetization curves, Meissner effect, penetration depth*  
 74.30E *Thermodynamic properties; thermal conductivity*  
 74.30G *Response to electromagnetic fields, nuclear magnetic resonance, ultrasonic attenuation*  
 74.40 Fluctuations and critical effects  
 74.50 Proximity effects, tunnelling phenomena, and Josephson effect  
 74.55 Type-I superconductivity  
 74.60 Type-II superconductivity  
 74.60E *Mixed state,  $H_{c2}$  surface sheath*  
 74.60G *Flux pinning; fluxon-defect interactions*  
 74.60J *Critical currents*  
 74.70 Superconducting materials  
 74.70D *Material effects on  $T_c$ ,  $K$ , critical currents*  
 74.70G *Type-I superconductors (non-transition metals)*  
 74.70L *Type-II superconductors (transition metals, alloys and compounds)*  
 74.70N *Dirty superconductors*  
 74.70P *Materials for high-field applications*  
 74.90 Other topics in superconductivity
- 75.00 MAGNETIC PROPERTIES AND MATERIALS  
 75.10 General theory and models of magnetic ordering  
 75.10D *Crystal-field theory and spin Hamiltonians*  
 75.10H *Ising and other classical spin models*  
 75.10J *Heisenberg and other quantized localized spin models*  
 75.10L *Band and itinerant models*  
 75.20 Diamagnetism and paramagnetism  
 75.20C *Nonmetals*  
 75.20E *Metals and alloys*  
 75.20H *Local moment in dilute alloys; Kondo effect*  
 75.25 Spin arrangements in magnetically ordered materials (neutron studies, etc.)  
 75.30 Magnetically ordered materials, other intrinsic properties  
 75.30C *Saturation moments and magnetic susceptibility*  
 75.30D *Spin waves*  
 75.30E *Exchange and superexchange interactions*  
 75.30G *Anisotropy*



- 75.30H *Magnetic impurity interactions*
- 75.30K *Magnetic phase boundaries*
- 75.30S *Magnetocaloric effect*
- 75.40 *Critical-point effects, specific heats, short-range order*
- 75.40D *Ising and other classical spin models*
- 75.40F *Heisenberg and other quantized spin models*
- 75.50 *Studies of specific magnetic materials*
- 75.50B *Ferromagnetism of Fe and its alloys*
- 75.50C *Ferromagnetism of other metals*
- 75.50D *Ferromagnetism of nonmetals*
- 75.50E *Antiferromagnetics*
- 75.50G *Ferrimagnetics*
- 75.50K *Amorphous magnetic materials*
- 75.50M *Magnetic liquids*
- 75.60 *Domain effects, magnetization curves, and hysteresis*
- 75.60C *Domain walls and domain structure*
- 75.60E *Magnetization curves, hysteresis, Barkhausen and related effects*
- 75.60G *High coercivity materials*
- 75.60J *Fine-particle systems*
- 75.60L *Magnetic aftereffects*
- 75.60N *Magnetic annealing and temperature-hysteresis effects*
- 75.70 *Magnetic films and plates*
- 75.70K *Domain structure (magnetic bubbles)*
- 75.80 *Magnetomechanical and magnetoelectric effects, magnetostriction*
- 75.90 *Other topics in magnetic properties and materials*
- 76.00 **MAGNETIC RESONANCES AND RELAXATION IN CONDENSED MATTER: MOSSBAUER EFFECT**
- 76.20 *General theory of resonances and relaxation*
- 76.30 *Electron paramagnetic resonance and relaxation*
- 76.30D *Ions and impurities: general*
- 76.30F *Iron group (3d) ions and impurities (Ti-Cu)*
- 76.30H *Platinum and palladium group (4d and 5d) ions and impurities (Zr-Ag and Hf-Au)*
- 76.30K *Rare-earth ions and impurities*
- 76.30L *Other ions and impurities*
- 76.30M *Colour centres and other defects*
- 76.30P *Conduction electrons*
- 76.30R *Free radicals*
- 76.40 *Diamagnetic and cyclotron resonances*
- 76.50 *Ferromagnetic, antiferromagnetic, and ferrimagnetic resonances; spin wave resonance*
- 76.60 *Nuclear magnetic resonance and relaxation*
- 76.60C *Chemical and Knight shifts*
- 76.60E *Relaxation effects*
- 76.60G *Quadrupole resonance*
- 76.60L *Spin echoes*
- 76.70 *Magnetic double resonances and cross effects*
- 76.70D *Electron-nuclear double resonance (ENDOR)*
- 76.70E *Dynamical nuclear polarization*
- 76.70F *Double nuclear magnetic resonance (DNMR)*
- 76.70H *Optical double magnetic resonance (ODMR)*
- 76.70K *Electron double resonance (ELDOR)*
- 76.80 *Mossbauer effect; other gamma-ray spectroscopy*
- 76.90 *Other topics in magnetic resonances and relaxation*
- 77.00 **DIELECTRIC PROPERTIES AND MATERIALS**
- 77.20 *Permittivity*
- 77.30 *Polarization and depolarization effects*
- 77.40 *Dielectric loss and relaxation*
- 77.50 *Dielectric breakdown and space-charge effects*
- 77.55 *Dielectric thin films*
- 77.60 *Piezoelectricity and electrostriction*
- 77.70 *Pyroelectric and electrocaloric effects*
- 77.80 *Ferroelectricity and antiferroelectricity*
- 77.80B *Transitions and Curie point*
- 77.80D *Domain structure and effects; hysteresis*
- 77.85 *Electrical resonances*
- 77.90 *Other topics in dielectric properties and materials*
- 78.00 **OPTICAL PROPERTIES AND CONDENSED MATTER SPECTROSCOPY AND OTHER INTERACTIONS OF MATTER WITH PARTICLES AND RADIATION**
- 78.20 *Optical properties and materials*
- 78.20B *General theory (for pure homogeneous materials)*
- 78.20D *Optical constants and parameters*
- 78.20E *Optical rotatory power*
- 78.20F *Birefringence*
- 78.20H *Piezo-, elasto- and acousto-optical effects*
- 78.20J *Electro-optical effects*
- 78.20L *Magneto-optical effects*
- 78.20N *Thermo-optical effects*
- 78.30 *Infrared and Raman spectra and scattering*
- 78.35 *Brillouin and Rayleigh scattering*
- 78.40 *Visible and ultraviolet spectra*
- 78.45 *Stimulated emission*
- 78.50 *Impurity and defect absorption in solids*
- 78.55 *Photoluminescence*
- 78.60 *Other luminescence spectra and radiative recombination*
- 78.60F *Electroluminescence*
- 78.60H *Cathodoluminescence, ionoluminescence*
- 78.60K *Thermoluminescence*
- 78.60M *Sonoluminescence, triboluminescence*
- 78.60P *Chemiluminescence*
- 78.65 *Optical properties of thin films*
- 78.70 *Other interactions of matter with particles and radiation*
- 78.70B *Positron annihilation*
- 78.70C *X-ray scattering*
- 78.70D *X-ray absorption and absorption edges*
- 78.70E *X-ray emission threshold and fluorescence*
- 78.70G *Microwave and radiofrequency spectra*
- 78.90 *Other topics in optical properties of condensed matter and other interactions of matter with particles*
- 79.00 **ELECTRON AND ION EMISSION BY LIQUIDS AND SOLIDS: IMPACT PHENOMENA**
- 79.20 *Impact phenomena*
- 79.20D *Laser-light impact phenomena*
- 79.20F *Electron impact: Auger emission*
- 79.20H *Electron impact: secondary emission*
- 79.20K *Other electron impact phenomena*
- 79.20N *Atom, molecule, and ion impact*
- 79.20R *Atomic and molecular beam interactions*
- 79.40 *Thermionic emission*
- 79.60 *Photoemission and photoelectron spectra*
- 79.70 *Field emission and field ionization*
- 79.75 *Exoelectron emission*
- 79.80 *Resonance tunnelling*
- 79.90 *Other topics in emission and impact phenomena in condensed matter*
- 80.00 **CROSS-DISCIPLINARY PHYSICS AND RELATED AREAS OF SCIENCE AND TECHNOLOGY**
- 81.00 **MATERIALS SCIENCE**
- 81.10 *Methods of crystal growth and purification*
- 81.10B *Growth from vapour*
- 81.10D *Growth from solutions*
- 81.10F *Growth from melts*

81.10H	<i>Zone melting and zone refining</i>	82.55	Radiochemistry
81.10J	<i>Growth from solid phases</i>	82.60	Chemical thermodynamics
81.15	Methods of thin film depositions	82.65	Surface processes
81.15C	<i>Deposition by cathodic sputtering</i>	82.70	Disperse systems
81.15G	<i>Vacuum deposition</i>	82.80	Chemical analysis and related physical methods of analysis
81.15H	<i>Chemical vapour deposition</i>	82.90	Other topics in physical chemistry
81.15J	<i>Ion plating and other vapour deposition</i>		
81.15L	<i>Deposition from liquid phases (melts and solutions)</i>	86.00	ENERGY RESEARCH AND ENVIRONMENTAL SCIENCE
81.20	Other methods of preparation of materials	86.10	Energy resources and their utilisation
81.20C	<i>Vacuum methods</i>	86.10B	<i>Fossil and other fuels</i>
81.20E	<i>Powder techniques, compaction and sintering</i>	86.10D	<i>Wind energy</i>
81.20G	<i>Specific metals and alloys (compacts, pseudoalloys)</i>	86.10F	<i>Tidal and flow energy</i>
81.20J	<i>Dispersion-, fibre- and platelet-reinforced metal-based composites</i>	86.10H	<i>Geothermal energy</i>
81.20L	<i>Ceramics and refractories</i>	86.10K	<i>Solar energy</i>
81.20N	<i>Cermets, ceramic and refractory composites</i>	86.10N	<i>Nuclear energy</i>
81.20P	<i>Glasses</i>	86.10Z	<i>Other topics</i>
81.20Q	<i>Glass-based composites, vitroceramics</i>	86.30	Energy conversion
81.20S	<i>Polymers</i>	86.30D	<i>Electrochemical conversion: general</i>
81.20T	<i>Reinforced polymers and polymer-based composites</i>	86.30E	<i>Primary cells</i>
81.30	Phase diagrams and microstructures developed by solidification and solid-solid phase transformations	86.30F	<i>Secondary cells</i>
81.30B	<i>Phase diagrams of metals and alloys</i>	86.30G	<i>Fuel cells</i>
81.30D	<i>Phase diagrams of other materials</i>	86.30J	<i>Photoelectric conversion: solar cells and arrays</i>
81.30F	<i>Solidification</i>	86.30K	<i>Photoelectrochemical conversion</i>
81.30H	<i>Constant-composition solid-solid phase transformations: polymorphic, massive, order-disorder</i>	86.30L	<i>Electrogasdynamic and magnetohydrodynamic conversion</i>
81.30K	<i>Martensitic transformations</i>	86.30M	<i>Thermoelectric conversion</i>
81.30M	<i>Precipitation</i>	86.30N	<i>Thermionic conversion</i>
81.40	Treatment of materials and its effects on microstructures and properties	86.30P	<i>Photosynthesis</i>
81.40C	<i>Solid solution hardening, precipitation hardening, dispersion hardening</i>	86.30Q	<i>Chemical energy conversion</i>
81.40E	<i>Cold working, work hardening; annealing, recovery and recrystallisation; textures</i>	86.30R	<i>Thermal energy conversion (heat engines and heat pumps)</i>
81.40G	<i>Other heat and thermomechanical treatments</i>	86.30S	<i>Photothermal conversion</i>
81.40J	<i>Elasticity and anelasticity</i>	86.30Z	<i>Other topics</i>
81.40L	<i>Deformation, plasticity and creep</i>	86.40	Energy storage (secondary energy)
81.40N	<i>Fatigue, embrittlement, and fracture</i>	86.40C	<i>Storage in mechanical energy</i>
81.40P	<i>Friction, lubrication, and wear</i>	86.40F	<i>Storage in thermal energy</i>
81.40R	<i>Electrical and magnetic properties (related to treatment conditions)</i>	86.40H	<i>Storage in chemical energy</i>
81.40T	<i>Optical properties (related to treatment conditions)</i>	86.40K	<i>Hydrogen storage and technology</i>
81.60	Corrosion, oxidation and surface treatments	86.40Z	<i>Other topics</i>
81.60B	<i>Metals and alloys</i>	86.60	Requirement for energy: ecological aspects
81.70	Materials testing	86.70	Environmental science
81.90	Other topics in materials science	86.70C	<i>Soil</i>
82.00	PHYSICAL CHEMISTRY	86.70E	<i>Water</i>
82.20	Chemical kinetics	86.70G	<i>Atmosphere</i>
82.20K	<i>Potential energy surfaces for chemical reactions</i>	86.70J	<i>Noise</i>
82.20M	<i>Nonequilibrium kinetics</i>	86.70L	<i>Measurement techniques in environmental science</i>
82.20R	<i>Energy distribution and transfer, relaxation</i>	86.70Z	<i>Other topics</i>
82.30	Specific chemical reactions; reaction mechanisms	86.90	Other topics in energy research and environmental science
82.35	Polymer reactions and polymerization	87.00	BIOPHYSICS, MEDICAL PHYSICS, AND BIOMEDICAL ENGINEERING
82.40	Chemical kinetics and reactions; special regimes	87.10	General, theoretical, and mathematical biophysics
82.40D	<i>Atomic and molecular beam reactions</i>	87.15	Molecular biophysics
82.40T	<i>Chemiluminescence and chemical laser kinetics</i>	87.15B	<i>Structure, configuration, conformation, and active sites at the biomolecular level</i>
82.45	Electrochemistry and electrophoresis	87.15M	<i>Interactions with radiations at the biomolecular level</i>
82.50	Photochemistry and radiation chemistry	87.16	Biothermics
82.50E	<i>Photodissociation, photoionization as studied by luminescence and radiationless transitions</i>	87.20	Membrane biophysics
		87.25	Cellular biophysics
		87.25D	<i>Biological transport; cellular and subcellular transmembrane physics</i>
		87.30	Biophysics of neurophysiological processes
		87.32	Physiological optics, vision

- 87.32C *Anatomy and optics of the eye*  
 87.32E *Physiology of the eye; nerve structure and function*  
 87.32L *Light detection; adaptation and discrimination*  
 87.32N *Colour detection; adaptation and discrimination*  
 87.32S *Psychophysics of vision, visual perception, binocular vision*  
 87.34 Audition  
 87.36 Speech  
 87.38 Mechano- and chemio-ceptions  
 87.40 Biomagnetism  
 87.45 Biomechanics, biorheology, biological fluid dynamics  
 87.50 Biological effects of radiations  
 87.50B *Interactions of biosystems with radiations*  
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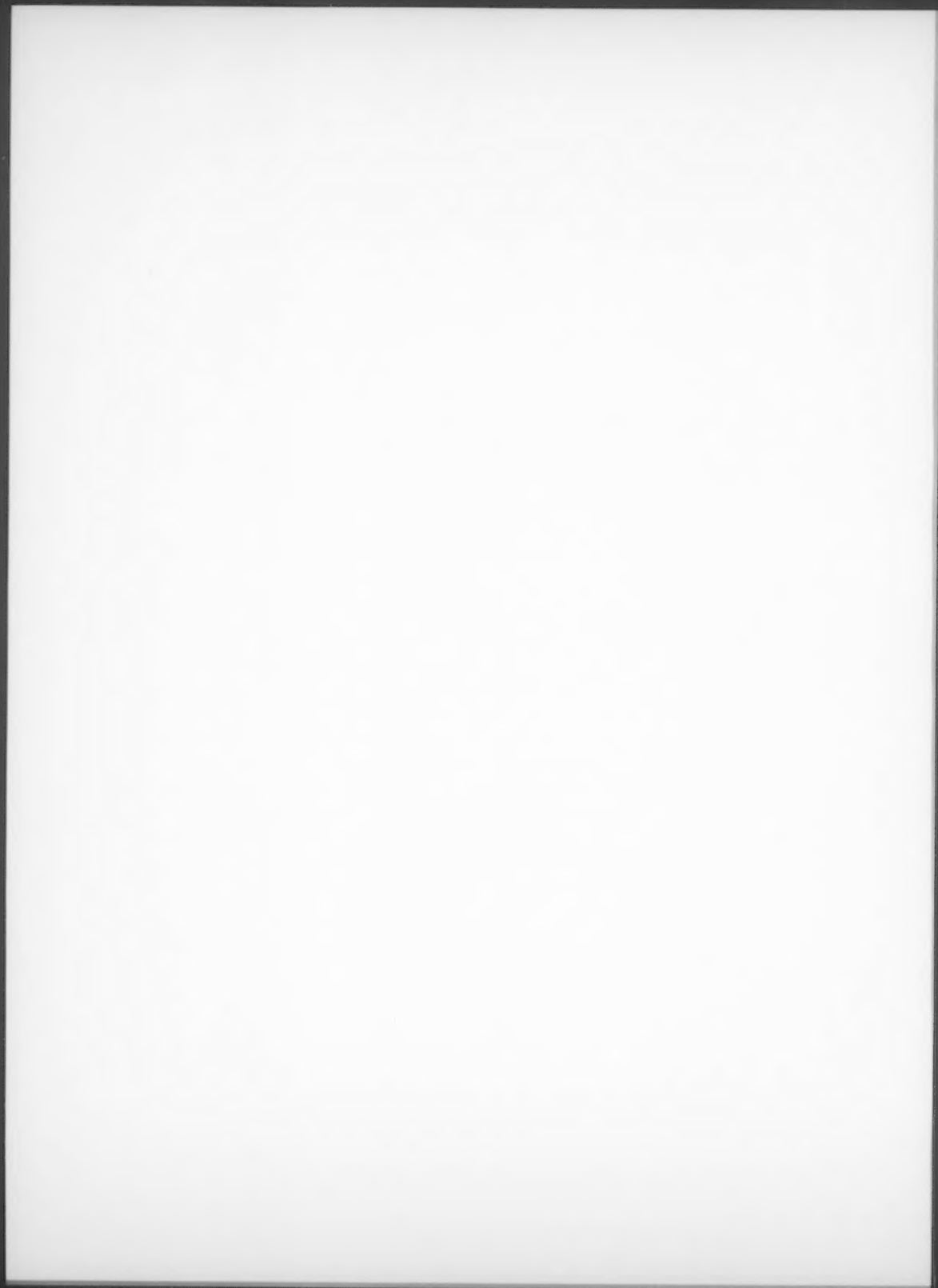
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